Ogden Air Logistics Center

U.S. AIR FORCE

Repainting of Military Aircraft
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Overview

- The Problem (Chrome VI)
- Facts about Lab, OEM and ALC's Chromated Conversion Coating Processes
- PreKote Process
- How Clean Is Clean
- Total Non-Chrome Process

Hexavalent Chrome Cr(VI)

- **Hexavalent Chrome INHIBITS CORROSION "Nothing performs like Cr(VI)"**
- **Chromic Acid (CrO_3), is used in chromated conversion coatings (Alodine)**
  - **Known carcinogen**
  - **Digest 1.5 grams of it and it will kill you**
- **Strontium Chromate ($SrCrO_4$), is a hexavalent chromium salt that is used in aerospace primers**
  - **Best inhibitor for Filiform Corrosion**

Present Consensus

- There is a need to reduce or eliminate the use of hexavalent chrome in the painting of aircraft
- Corrosion protection cannot be sacrificed
- Chromium is necessary in either the primer or the conversion coat

Non-Chrome?

- Non-Chrome Primer or
- Non-Chrome Conversion Coating
  - Drop in Alodine (5200/5700)
  - Chrome Three
  - PreKote
  - Sol-Gel

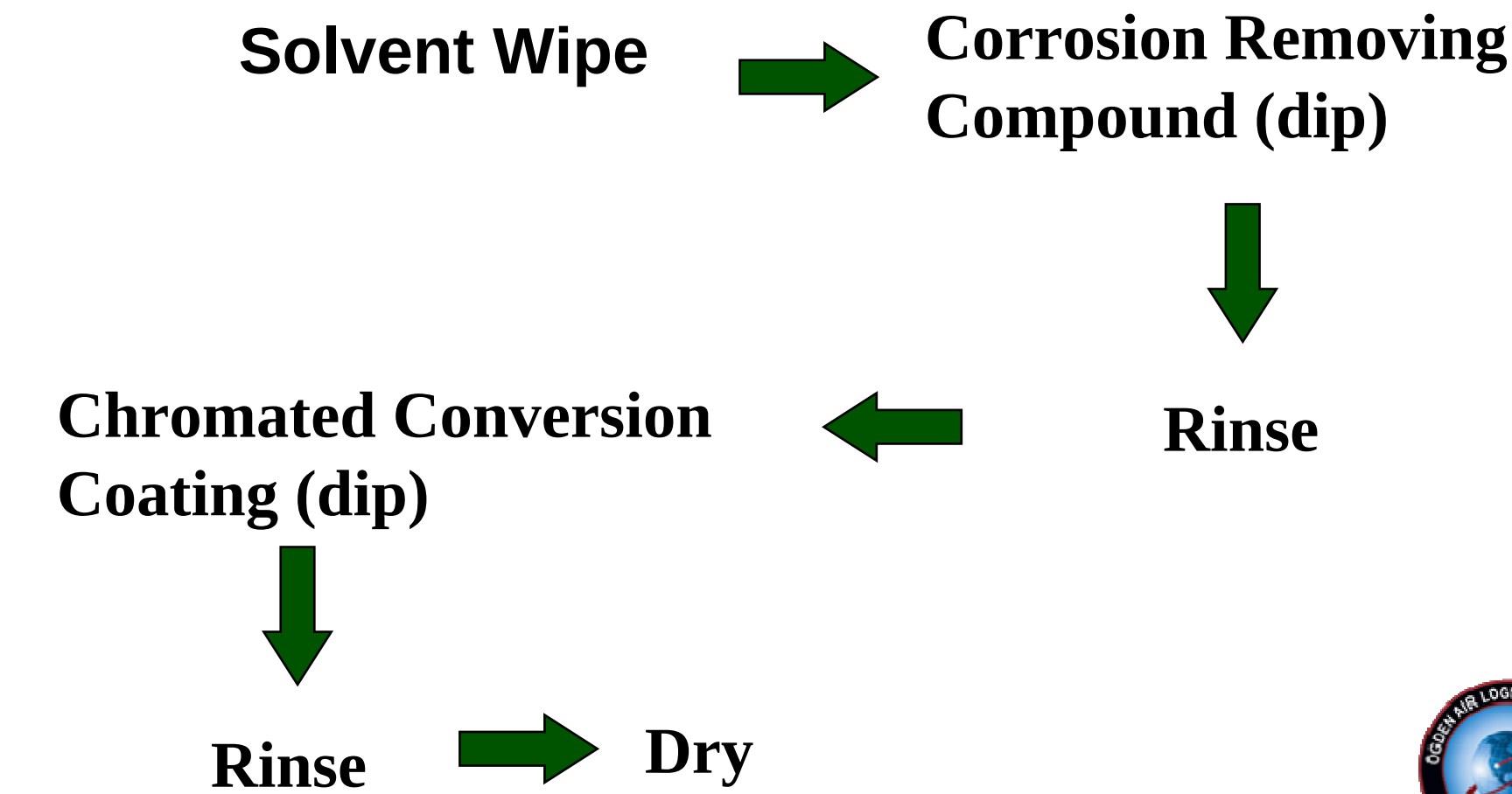
Reason for a Primer

- The PRIMER is the HEART of the PAINT SYSTEM corrosion resistance properties
- For example: The correct formulation with Strontium Chromate will prevent Filiform Corrosion if the conversion coat
  - Is not too thick (Wash Primers)
  - Provides good adhesion

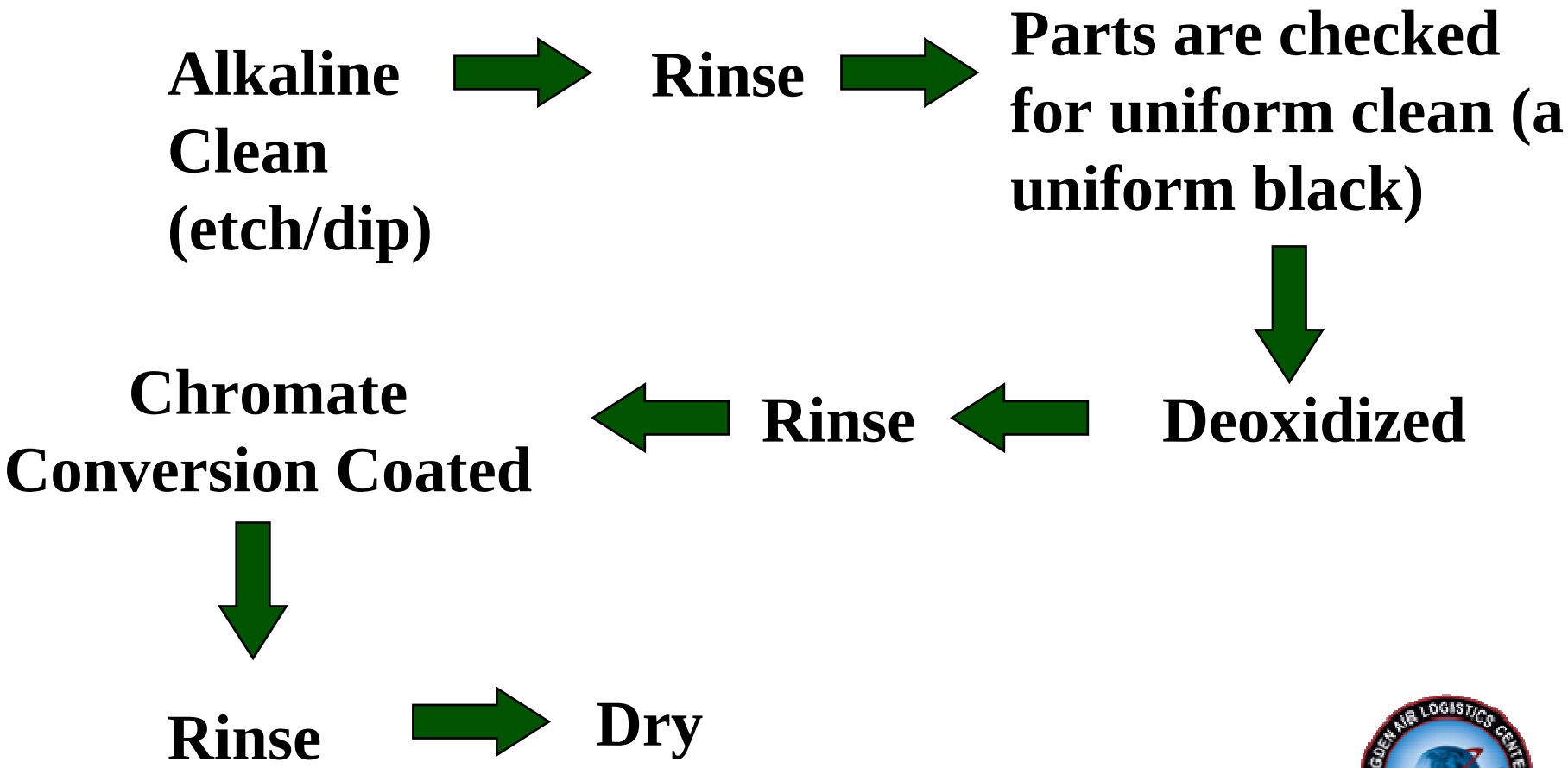
Chromated Conversion Coating (Alodine Process)

- Laboratory
- Original Equipment Manufacture (OEM)
- ALC's Depot and Field

Laboratory Prep for Conversion Coatings



OEM Process

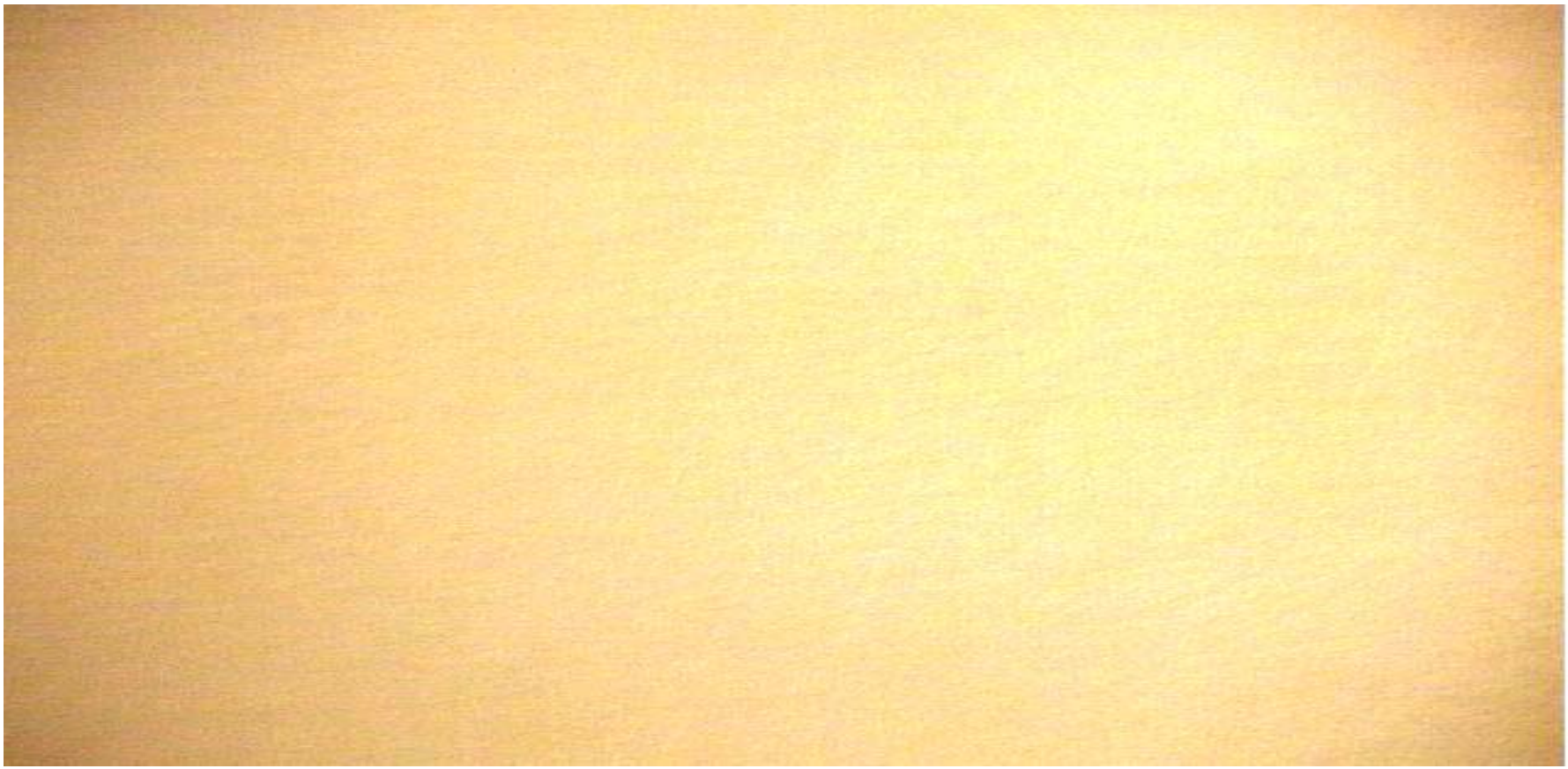

Alkaline Clean (etch/dip)
Rinse
Parts are checked for uniform clean (a uniform black)
Deoxidized
Rinse
Chromate Conversion Coated
Rinse
Dry

Controls for the Process

- Checked daily/weekly
  - pH within 0.2 units
  - Material concentration.
  - Bath temperature maintained at ±5^{0}F
- Checked monthly
  - Corrosion resistance

Prep for Paint

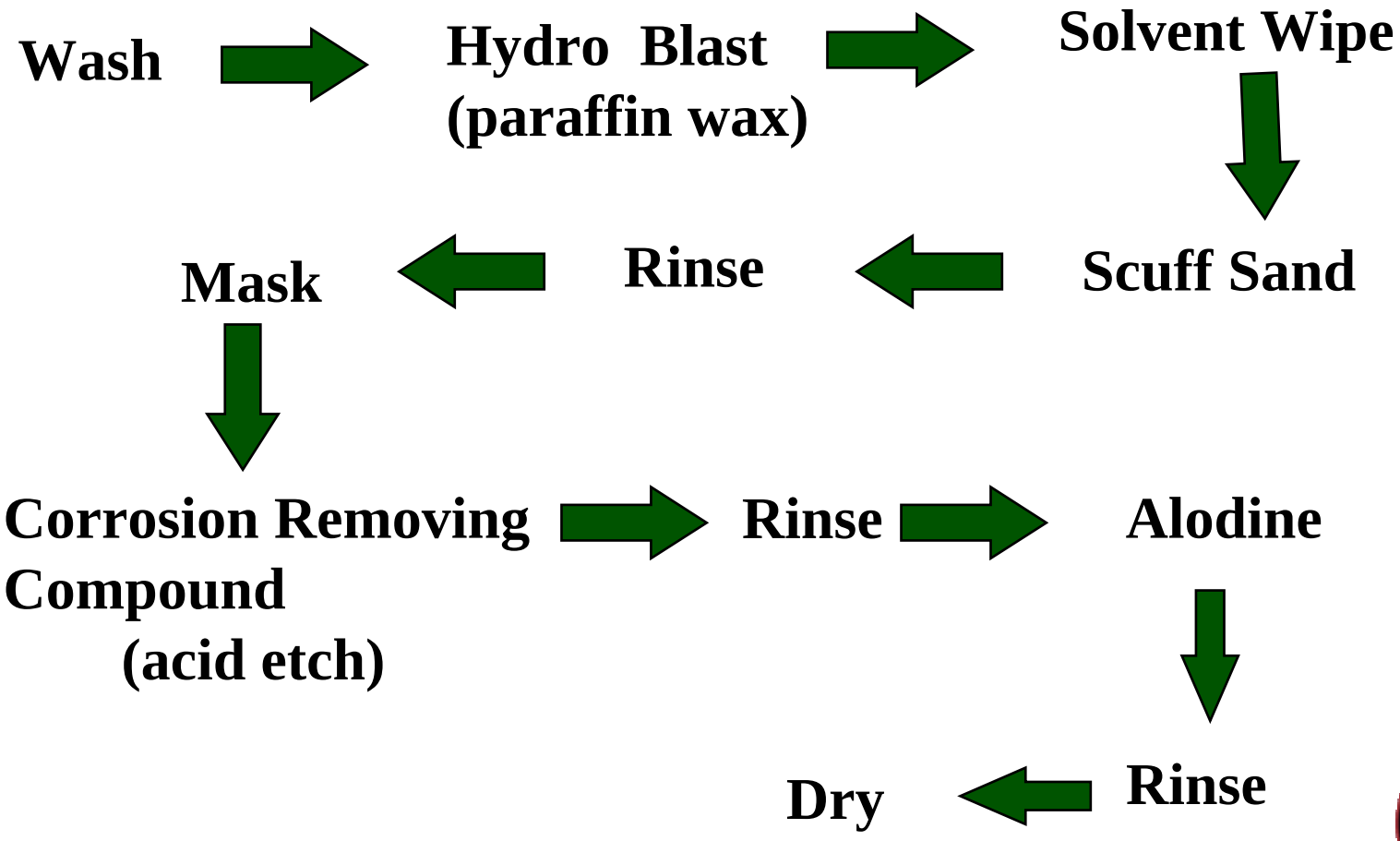
- Original Equipment Manufacture (OEM)
- Laboratory Test Panel



Problems with Chromated Conversion Coatings

- Passing corrosion resistance properties of 336 hours
  - Film weight of 40 Milligrams per square foot (every parameter must be perfect) Therefore a experienced technician, clean panels, pH and concentration of chemicals must be within limits)
- Very brittle (Ceramic)
- Not forgiving (surface must be very clean)

Ogden's Cr Conversion Process for F-16s



ALC's Depot and Field Cr Conversion Process

- The chromated conversion coating comes in a drum which may be 3,6,9,12 months old before used
  - NO pH adjustments
  - NO testing of the product
  - NO checks of any kind to verify corrosion resistance
- Surface must be pristine clean
  - Water Brake Free Test may not be effective
    - In sufficient rinsing (soap residue)
    - Painters just not paying attention


BREATHING AIR

Summery for Corrosion Protection

- Chromium is necessary in either the primer or the conversion coat
- Chromated conversion coatings gives very little protection for ALC's Depot and Field use.
- Chromated PRIMERS gives the best protection for ALC's Depot and Field use

Non- Chrome Replacements

- Have the same problems as Alodine
  - Look great in the lab
  - Work great for OEM's
  - Surface must be very clean
- In addition
  - Very hard if not impossible to tell if they take
  - Still require an acid etch and/or deoxidizer
- PreKote being the exception

Leading Edge
A-10 AC # 657 D. Monthan

Alodine Side

PreKote Side

How Clean Is Clean

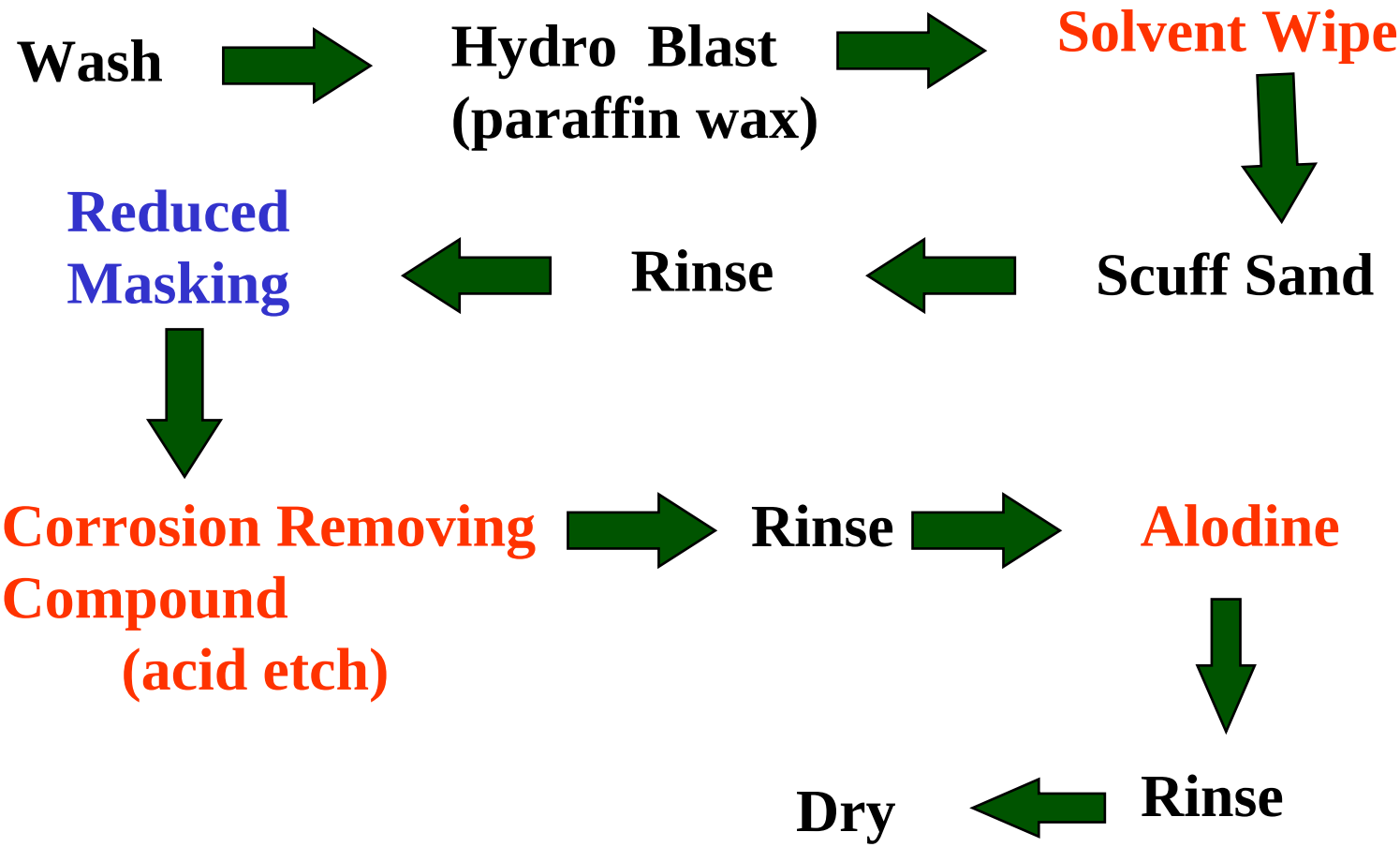
Hand Versus Pneumatic Scrubbing

Contaminants	Hand Scrub MEK	Hand Scrub Soap	Pneumatic Scrub Soap	Pneumatic Scrub C. R.C.
PMB	99%	76%	97%	97%
Grease	40%	20%	80%	40%
Hydraulic Fl.	40%	20%	80%	40%
Fuel	40%	20%	80%	60%

PMB= Plastic Media Blast

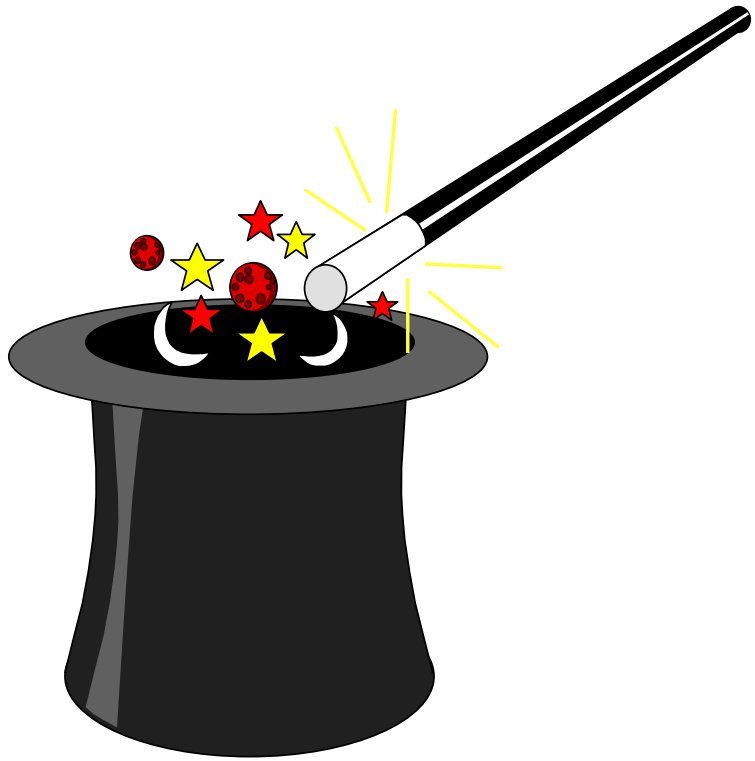
C.R.C.= Corrosion Removing Compound (acid etch)

PreKote has Eliminated



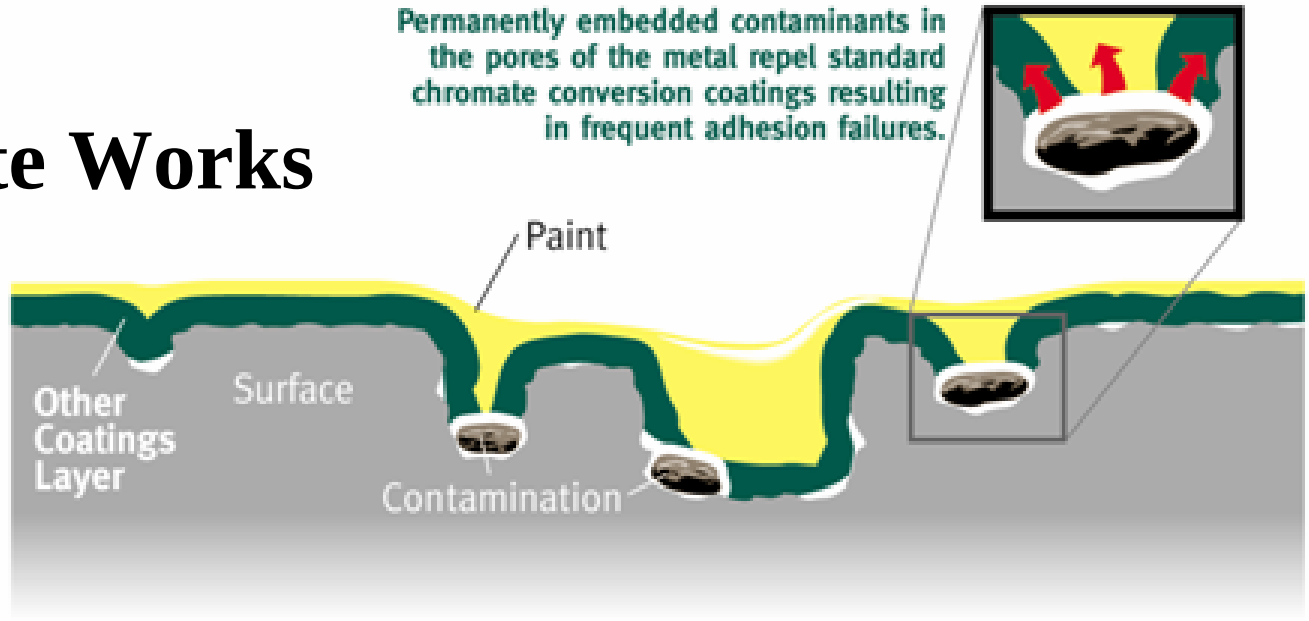
Is PreKote Magic?

- NO!!!
- It cleans
- It passivates metals
- Promotes Adhesion
  - It is very forgiving
  - Still needs to be water break free
- Saved time on all weapon system tested

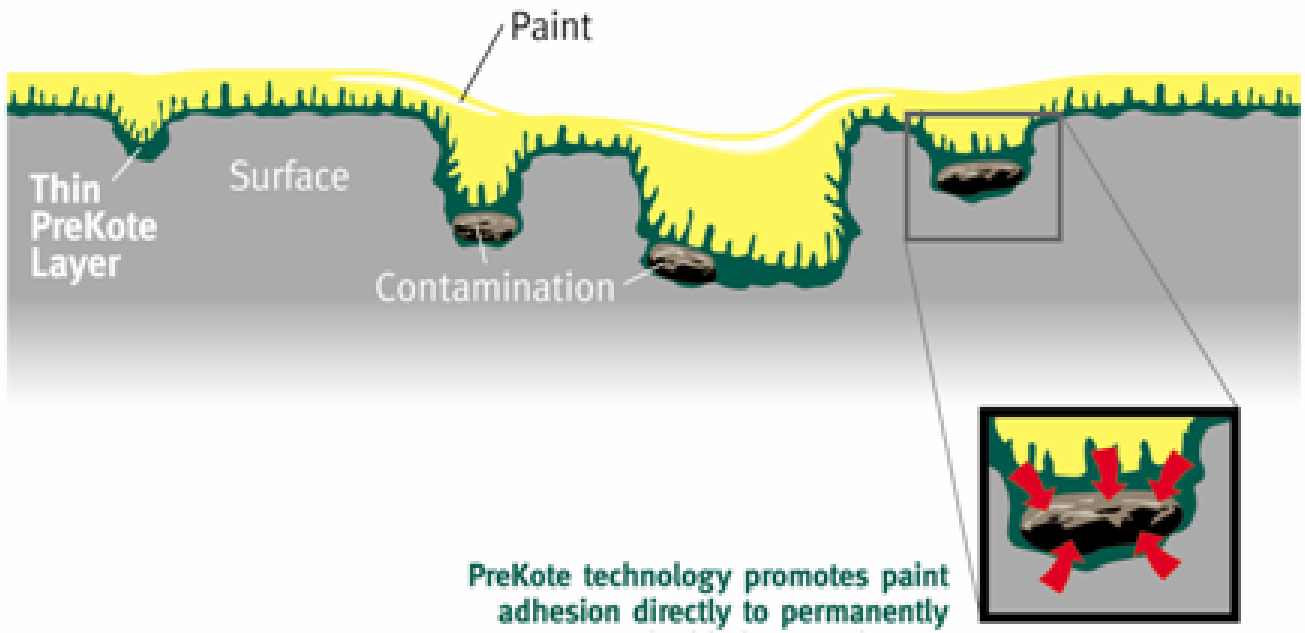


How PreKote Works

Chromate Conversion Process



PreKote Process



Environmentally

- PreKote use has:
  - Reduced the maintainers exposure to a highly soluble, proven carcinogen
  - Reduced the level of PPE required
  - Reduced the number of waste streams

The Best System Process for ALC and Field use

- Safe for
  - Personnel
  - Environment
- Great corrosion protection when use with a chromate primer
- GREAT ADHESION

In the Future
A TOTAL NON-CHROME SYSTEM

Hill AFB Laboratory is presently testing for a total non-chrome system

Paint Systems

- Five different paint companies
- Twelve different non-chrome primers
- Five different Advanced Performance Coating (APC) type top coats
- The conversion coating was PreKote

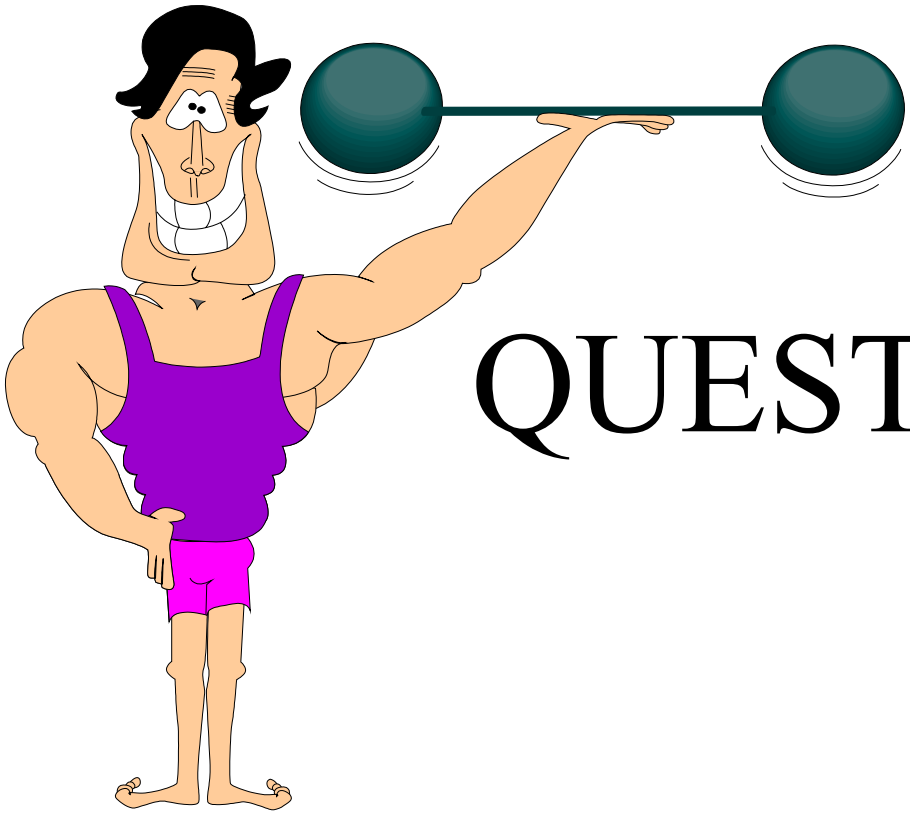
Test Results

- Only one paint system was acceptable
- The primer was a waterborne
- Testing is on going with a high solid version as well as more testing with the waterborne

2000 Hours Salt Pray

Joint Test Plan

- Testing of New Primer
  - Coatings Technology Integration Office (CTIO)
    - Alodine 5200 & 5700
  - Hill AFB
    - PreKote
- Corrosion Office (AFCPCO)
  - Writing test plan
- PreKote test Planes
  - T-38
  - F-16
  - A-10
- Alodine 5200 & 5700?
  - F-15
- Alodine 1200
  - F-15



QUESTIONS